Adaptive Response Surface Method with Smoothing Spline in the Grid

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A huge amount of calculation is needed for optimal design of actual structures. Various studies on parallel and distributed calculation have been performed, in relation to a collection of computing resources in a local area network. Recently researches on a highly efficient wide area calculation system called the "Grid" have appeared. In order to realize the optimal design in the Grid, the following requirements have to be satisfied : (1) Processing with few dependencies can be performed asynchronously and (2) An optimal solution corresponding to required accuracy can be obtained robustly and promptly. In the present study, we have developed a distributed optimum design system in the Grid, considering the above requirements simultaneously. In this system, evaluation calculations including physical phenomena, such as structural analyses, are asynchronously performed in the Grid. Then, adaptive response surfaces are constructed using the results. Practical performances of the present system are clearly demonstrated through some examples. One of the examples is shown below. Figure 1 shows an original function of stress constraint. Figure 2 shows the final response surface constructed using the sample points shown in Figure 3.
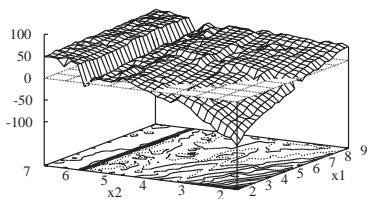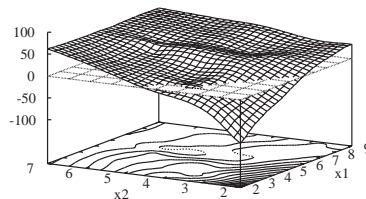

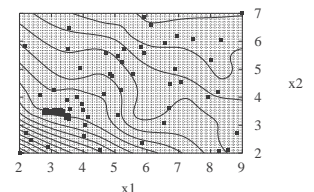| Figure 1: Original function | Figure 2: Response surface | Figure 3: Sample points |

References
[1] I. Foster, C. Kesseleman, "The Grid:Blueprint for a New Computing Infrastructure", *Morgan Kaufmann*, 1998.
[2] J. S. Simonoff, "Smoothing Methods in Statistics", *Springer-Verlag*, 1996.